

# PRODUCT SPECIFICATIONS

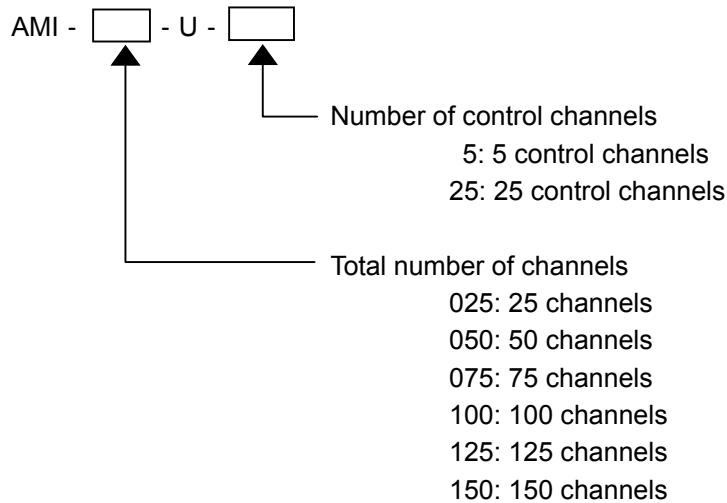
Product Name	No	4063201000900
<b>Ion Migration Evaluation System</b>	PREP.	06. 25. 2008
	REV.	Kusaka

This system continuously measures the insulation resistance of electronic components and printed circuit boards under high temperature and high humidity, in order to evaluate insulation reliability.

1. Product name      Ion Migration Evaluation System

2. Related documents      Product external view drawing 4063202000400  
Connection unit external view drawing 4063202000500

3. Model



4. Total number of channels and number of control channels

Selected			
	AMI-025-U-5 (25-channel)	AMI-050-U-5 (50-channel)	AMI-075-U-5 (75-channel)

Selected			
	AMI-100-U-5 (100-channel)	AMI-125-U-5 (125-channel)	AMI-150-U-5 (150-channel)

Selected			
	AMI-025-U-25 (25-channel)	AMI-050-U-25 (50-channel)	AMI-075-U-25 (75-channel)

Selected			
	AMI-100-U-25 (100-channel)	AMI-125-U-25 (125-channel)	AMI-150-U-25 (150-channel)

Remarks:

## 5. Options

Selected	
	None

Selected	
	English specification

Selected	
	LAN-supported test management software (Number of licenses: 1)

This software enables the user to check test status and process data from a PC connected to the LAN. For details, see the Optional Specifications.

Selected	
	Data processing software (With statistical processing capabilities)

Statistical processing enables a Weibull analysis from failure time data. For details, see the Optional Specifications.

Selected	
	Measuring cable (3 m)

This cable replaces the standard 1.5 m cable. The new length is 3 m. For details, see the Optional Specifications.

Selected	
	Scanner unit inter-connection unit extension cable (4 m from system)

This cable replaces the standard 2.5 m cable. The new length is 4 m. The new cable extends from the rear of the system. For details, see the Optional Specifications.

Selected			
	Power supply voltage 120V AC ± 10% Single-phase, 8.3A	Power supply voltage 220V AC ± 10% Single-phase, 4.5A	Power supply voltage 240V AC ± 10% Single-phase, 4.2A

\* The standard specification is 100V AC, single phase 10 A.

A single phase, single winding type of step-down transformer is used.

Selected		
	High voltage impression(300V)	High voltage impression(500V)

The applied voltage for specimens increases the maximum.

Selected		Number required
	Test board rack type A	

This optional rack efficiently tests the Surface Insulation Resistance(SIR) of SIR test coupon type IPC-B-24. For details, See the Optional Specifications.

Selected		Number required
	SIR test coupon type IPC-B-24	set(s)

This optional board works with the test board rack type A. For details, See the Optional Specifications.  
Note) One set consists of five test coupons.

## 6. Basic configuration

This system consists of a system controller, measurement unit and scanner.

### 6.1 System composition

(1) Cabinet rack	ESPEC	1
(2) System controller	DELL (OptiPlex Series <sup>*1</sup> )	1
(3) Monitor	DELL (15" TFT LCD)	1
(4) Test management software	ESPEC	1
(5) Data processing software	ESPEC	1
(6) OS (Preinstalled)	MICROSOFT (Windows XP® Professional)	1
(7) GPIB board (Built-into system controller)	NATIONAL INSTRUMENTS (778032-0112)	1
(8) Digital I/O board (Built-into system controller)	INTERFACE (PCI-2768C)	1
(9) Uninterrupted power supply unit	APC (CS350)	1
(10) Stress power supply unit (Constant voltage stressing)	ESPEC	1
(11) Scanner unit for high withstand voltage and low current	ESPEC	1
(12) Electrometer	KEITHLEY INSTRUMENTS (6514)	1
(13) Connection unit (With 2.5 m cable)	ESPEC <sup>*2</sup>	1
(14) Measuring cable		

For positive stressing, 1.5 m Colored single-wire cable with banana plug  
For negative stressing, 1.5 m 5-lead coaxial cable with 6-pin square coaxial plug  
Measuring cables are heat resistant to 150°C.

Over extended use, the signal label at the end of the cable may discolor, but this discoloration has no effect on performance.

Model	AMI-025-U-*	AMI-050-U-*	AMI-075-U-*
Quantity	25	50	75
	5	10	15

Remarks: <sup>\*1</sup> The system controller is subject to change without notice. The latest version available at the time of order or an equivalent controller is provided.

<sup>\*2</sup> There are 25 channels per connection unit.

Model	AMI-100-U-*	AMI-125-U-*	AMI-150-U-*
Quantity	100	125	150
	20	25	30

"5" or "25" is inserted for \*.

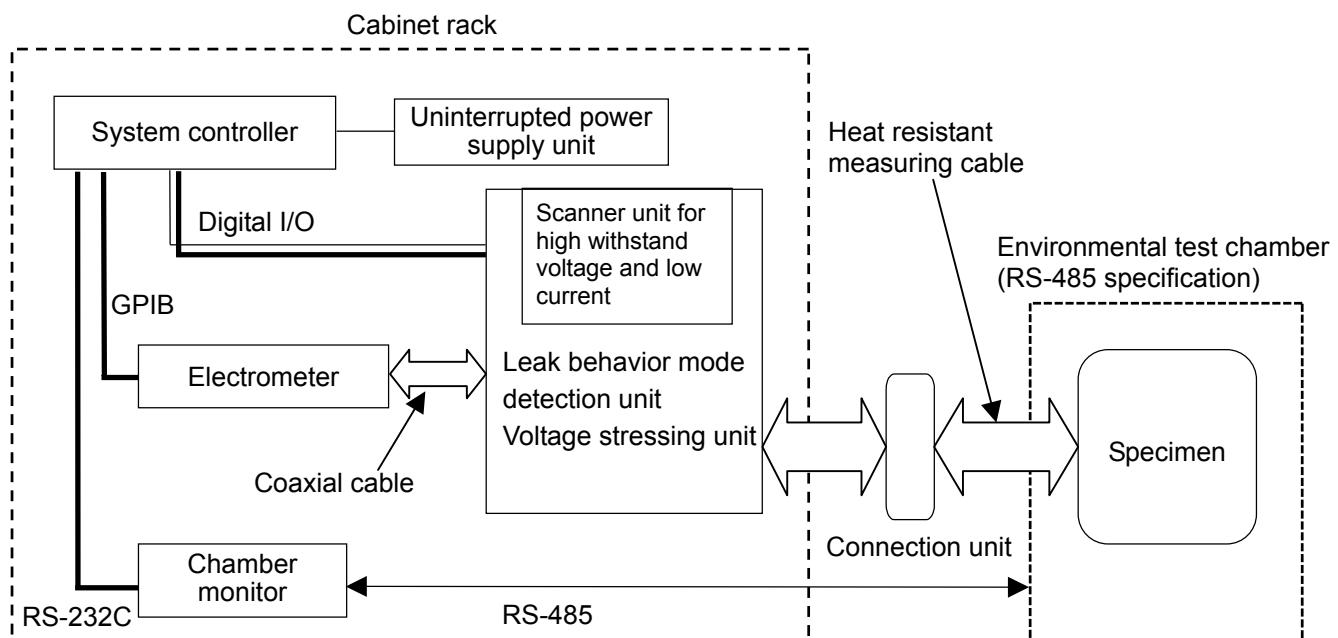
(15) Chamber monitor

ESPEC <sup>\*3</sup>

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## 6.2 Block diagram

The system is configured as shown below.



[System block diagram]

The environmental test chamber is outside the scope of these specifications.

## 6.3 Connection unit

The connection unit is provided to facilitate connections between this system and specimens. It connects the measuring cable from this system to the specimen cable.

### 6.3.1 Number of connectable channels by relay

25 channels per connection unit

### 6.3.2 Measuring cable

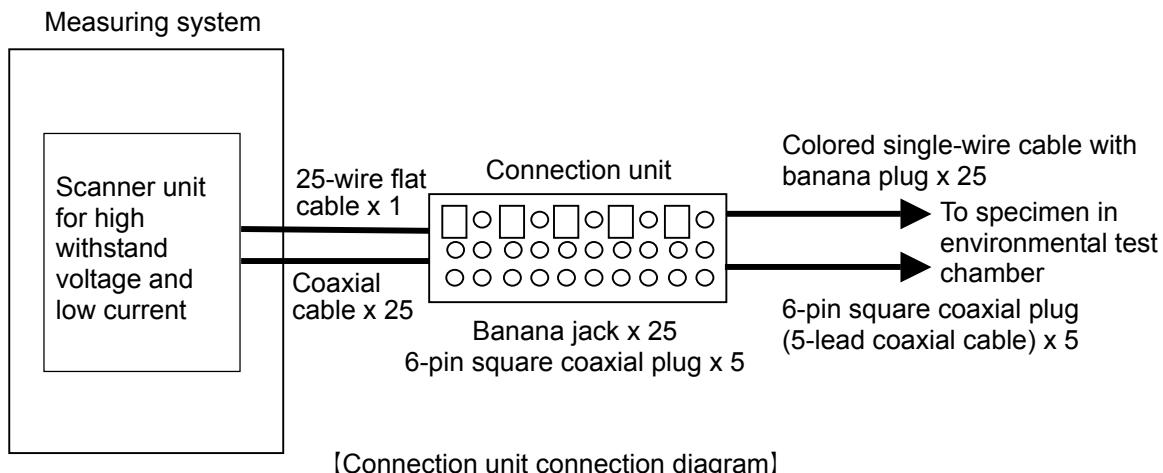
- (1) Positive side Heat resistant single-wire cable, L1.5 m
- (2) Negative side Heat resistant coaxial cable, L1.5 m

Remarks: \*3 Adapter for RS-485 communications between the PC and environmental test chamber.

## 6.3.3 Measuring cable working temperature range

-15 to +150°C

## 6.3.4 Connection unit connection diagram



## 7. Specifications

## 7.1 Power supply

(1) Power supply voltage	100V AC±10%, single-phase, 10 A
(2) Power supply frequency	50/60 Hz
(3) Power supply leakage breaker	
• Rated voltage	100V AC
• Sensitivity current	30 mA
• Trip time	Max. 0.1 sec
• Rated current	15 A
(4) Power cable	
• Cable length	3 m
• Cable end	3P socket plug (L, N, GND)

## 7.2 Guaranteed working environment

Temperature range: 5 to 35°C (No dewing)

7.3 Outer dimensions W 530 x H 1,750 x D 940 mm (Excluding projections)

7.4 Weight The weight of the standard specification system is as follows.

Model	AMI-025-U-*	AMI-050-U-*	AMI-075-U-*
Weight	233 kg	234 kg	240 kg

Model	AMI-100-U-*	AMI-125-U-*	AMI-150-U-*
Weight	255 kg	261 kg	262 kg

"5" or "25" is inserted for \*.

## 8. Installation

### 8.1 Installation conditions: Install the system in the following environment.

- On a flat, level floor that is sturdy enough to support the system's weight
- Where not subjected to excessive mechanical vibrations
- Where not exposed to direct sunlight
- Which is void of sharp temperature fluctuations
- Which is not dusty
- Which is not humid
- Away from flammables
- Where not exposed to combustible or corrosive gases
- Away from equipment that generates noise

### 8.2 Installation space

Secure a minimum 40 cm of space on the left, right and rear of the system. Though space requirements on the side of the system are not strictly enforced, always ensure enough space behind the system for a person to pass.

### 8.3 Grounding

Ensure 100 Ω or less resistance against ground.

\* To ensure safe system operation, ground the power cable.

## 9. Test performance

### 9.1 Measurement feature

#### (1) Stress power supply unit

Stress voltage	1.0 to 100V DC
Minimum setting resolution	0.1 V
Impressed voltage accuracy	± (0.7% of setting + 300 mV)

#### (2) Measurement equipment specifications

Current measurement range	0.1fA to 20mA
Minimum resolution	0.1fA
Measurement accuracy	±1.015% (20pA range FS)

#### (3) System measurement range and accuracy

(Including actual environmental effects)

Resistance measurement range	1.0 × 10 <sup>5</sup> Ω to 1.0 × 10 <sup>13</sup> Ω (In 100 V stressing)
	1.0 × 10 <sup>3</sup> Ω to 1.0 × 10 <sup>11</sup> Ω (In 1 V stressing)

DC measurement range	10pA to 1.0mA
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\* The resistance measurement range is determined by the DC measurement range and applied voltage.

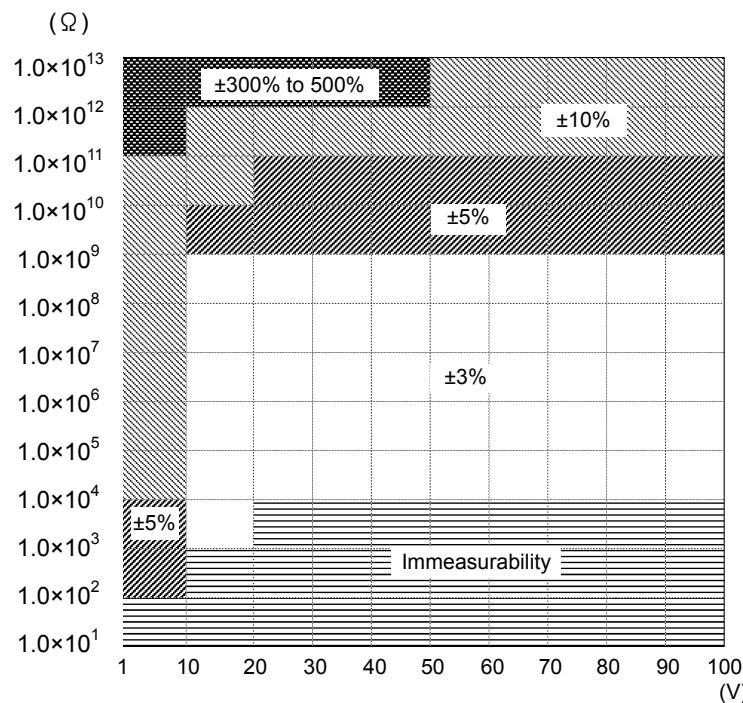
Resistance measurement accuracy

Accuracy is indicated at the end of the measuring cable.

#### [Measurement conditions]

Ambient temperature	23°C±5°C
Measurement mode	Long
Measurement range	Auto
Averaging (Times)	4
Charging time (sec)	60

\* The above specifications do not apply to the first measurement after measurement start.



- \* When accuracy in the above table falls on a borderline, the lower accuracy or immeasurability cell has priority.
- Resistances of  $10 \text{ k}\Omega$  ( $1.0 \times 10^4 \Omega$ ) and below cannot be measured because current exceeds the established limit.
- The above uniformity may not be produced in some system environments that customers have.

#### (4) Impressed voltage value in measurement

1.0 to 100V DC/0.1Vsteps

#### (5) Continuous test time

Max. 10,000 h

#### (6) Measurement time

(5-channel measurement/Max. 15 sec) + batch charging time

Measurement time can be shorter depending on the type of batch charging. Batch charging time is set in the test setup.

\* Charging time is unnecessary in the continuous stress voltage measurement mode. (This mode is used only when the measurement voltage and stress voltage are the same.)

## 9.2 Leak behavior mode

### (1) Mode overview

The leak behavior mode continuously monitors current leaks in-between samplings using a separate circuit than that for periodic measurement via measurement equipment, and stops stress voltage application and measurement on individual channels that exceed the limit. This mode makes it possible to accurately pinpoint instantaneous short-circuit phenomena caused by ion migration.

### (2) Specifications

#### ① Leak detection speed

Current flowing between samplings is detected at less than  $100 \mu \text{sec}$ .

### Processing after leak detection

Testing is ended on channels where leaks are detected within 10 msec after detecting the leak. And, the testing time when that leak occurred is recorded and saved in a file.

#### Leak detection setting range

Detectable leak setting range: 1  $\mu$  A to 500  $\mu$  A

Max. settable resolution: 1  $\mu$  A step

\* A referential resistance is calculated from the stress voltage for the input leak current and displayed in a separate area of the window.

## 9.3 Leak behavior check mode

### (1) Mode overview

The leak behavior check mode performs limit evaluations the specified number of times immediately after leak detection instead of ending testing, and determines whether to continue or end measurement on the specific channel based on that evaluation. When this mode is ON, channels where leaks were detected individually transition to the leak behavior check mode. Normal measurement resumes and continues if resistance is recovered within the specified number of cycles.

### (2) Mode selection

The leak behavior mode can be turned ON or OFF from the test setup window of the Ion Migration Evaluation System prior to starting the test.

When the leak behavior mode is OFF

The resistance in-between samplings is evaluated only at the measurement interval set in the test conditions and testing ends as set in the test conditions. (Only the leak behavior mode can be turned ON.)

When the leak behavior mode is ON

Testing transitions to the leak behavior check mode when triggered by the leak behavior mode. All other test end conditions are invalidated such that testing ends only when the number of check cycles or retries of the leak behavior check mode is reached.

\* The leak behavior check mode cannot be turned ON if the leak current is not set when registering test conditions.

### (3) Specifications

#### <First measurement after transitioning to the leak behavior check mode>

Resistance is measured on channels where leaks are detected using measurement equipment. If that resistance exceeds the limit, the leak behavior check mode is executed for the specified number of cycles. If the limit is not exceeded, normal operation is restored.

#### <Leak behavior check cycles>

The leak behavior check mode continues to apply the stress voltage even after a leak has been detected, measures resistance at the interval specified in "Holding Time" and evaluates the measured resistance against limits. This evaluation is executed the number of cycles specified in "Check Times". If the resistance is recovered during this evaluation, testing transitions back to normal measurement.

(Leaks are not redetected on channels during the leak behavior check mode.)

"Holding Time": Measurement interval in the leak behavior check mode

Sets the interval between resistance measurements after a leak has been detected.

Setting range 1 to 60 min in 1-min steps

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“Check Times”: Number of measurement cycles in the leak behavior check mode

Testing ends on channels where resistance is not recovered within the number of measurement cycles set here. If resistance is recovered, the cycle count up to that point is reset.

Setting range 1 to 10 times

Retries: Number of retries in the leak behavior check mode

Sets the number of retries in the leak behavior check mode that resistance can be recovered within the set number of check cycles and consequently normal measurement restored. Testing ends when the number of retries reaches the setting,

Setting range 1 to 1000 retries

\* Holding time, check cycles and retries must be individually set on the test setup window before testing starts.

#### (4) Test end condition of the leak behavior mode

If the number of check cycles reaches the set number of cycles

Stress voltage application is stopped and testing ends on the concerned channel.

If the number of retries reaches the set number of retries

Stress voltage application is stopped and testing ends on the concerned channel.

#### Reference

The leak behavior mode records individual channel behaviors while measurement equipment is idle in-between normal periodic measurements. If leaks are simultaneously detected on multiple channels, all behaviors may not be accurately pinpointed.

#### (5) Data processing

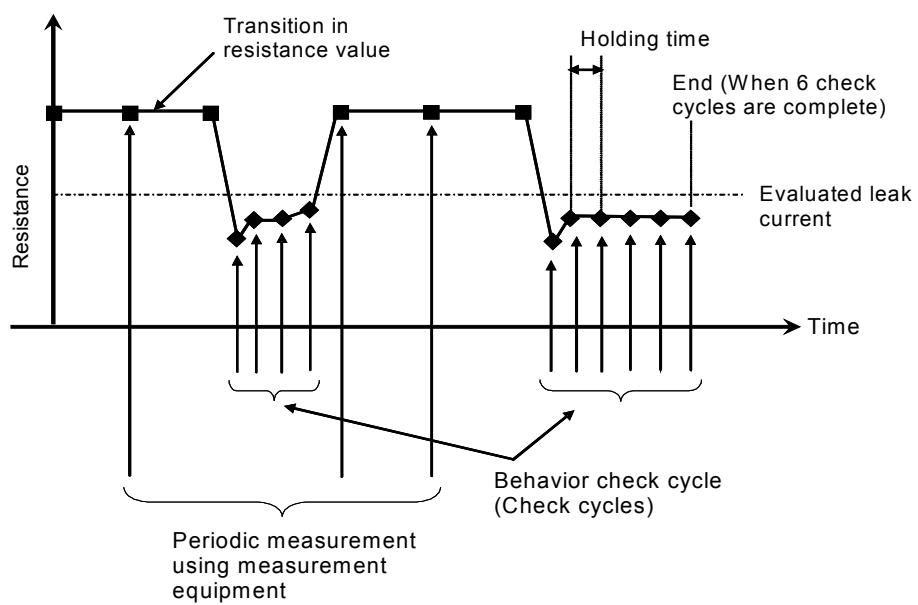
The insulation resistance measured during the leak behavior check mode after a leak detection can be confirmed in leak records using the statistical processing application. This resistance can also be linked to normal test data and plotted on graphs.

#### (6) Other

When testing ends because of sample leak behavior, testing for that particular sample is interrupted and cannot be resumed. However, testing for other samples is as follows.

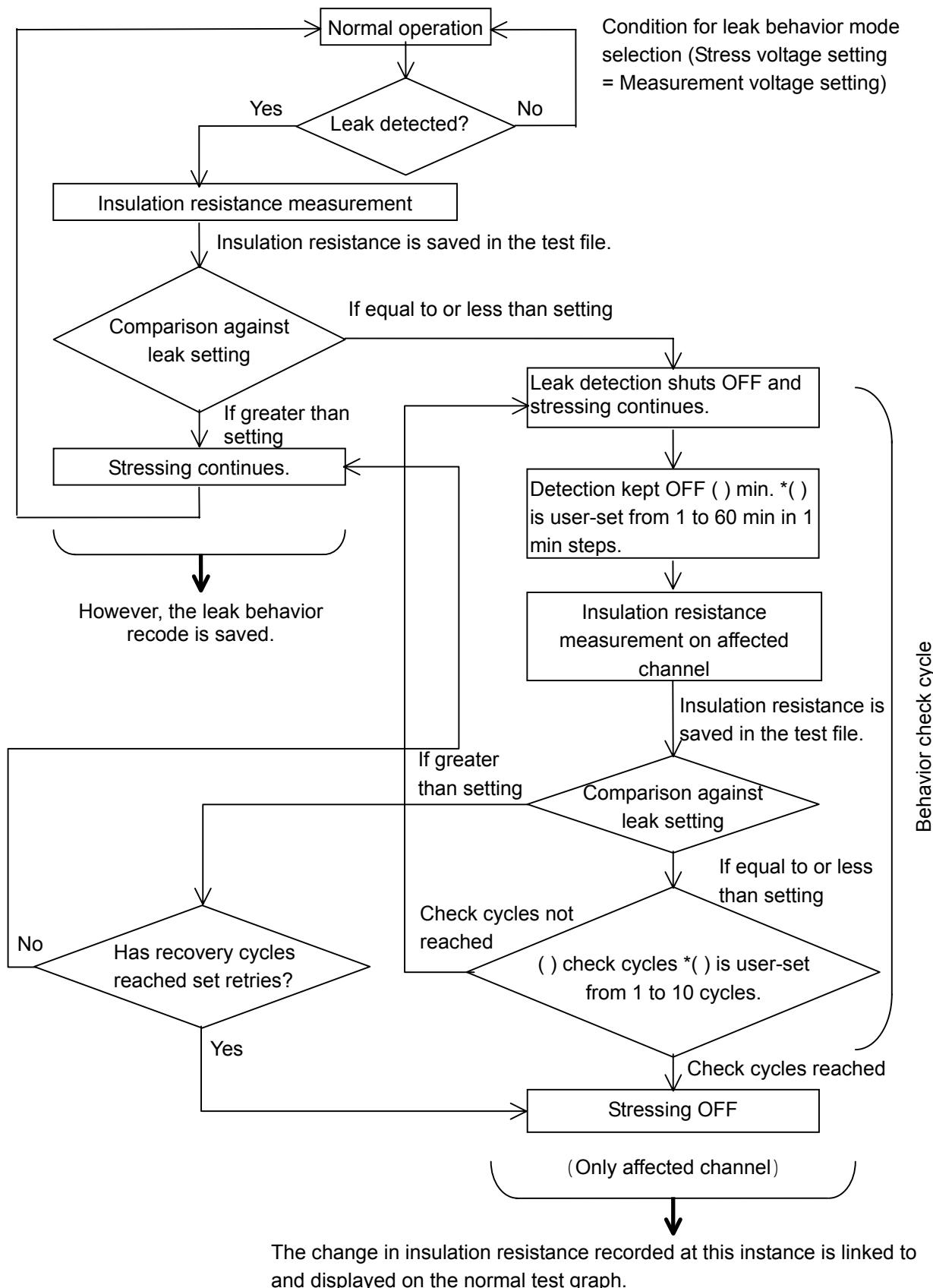
Testing continues as long as the application is not closed while testing is interrupted or resuming.

If the application is closed while testing is interrupted, the number of leak behavior cycles and retries reset and counting begins from 1. To continue testing in the leak behavior mode, do not close the application while testing is interrupted.



[Measurement in the leak behavior mode]

(7) Flowchart of continuous stress mode test after leak detection



## 10. System control specifications

This system software consists of software for managing tests and software for processing data.

### 10.1 Test management features

#### (1) Test conditions registration

Test conditions setting and saving

User creates a test conditions file. Conditions are managed as files.

Test setup

User selects a test condition file and test channels.

#### (2) Measurement unit control

Measurement mode

The below measurement conditions are set from the system controller.

Measurement averaging

Can be selected from amongst Short, Medium and Long.

Charging time during measurement

Can be set in 1 sec steps up to a max. 999 sec.

\* If the stress voltage and measurement voltage differ and measurement is performed while charging in the specimen and measurement unit is unstable, the measured value in that instant may differ from a measured value obtained when charging was stable. In such case, prolong charging time.

#### (3) Schedule management

Test duration

Measurements and data are managed by monitoring the measurement time set for each test.

Can be set in 1 h steps up to a max. 10,000 h.

\* Test setup and schedule can be set individually for each control channel.

#### (4) Measurement interval

Logarithmic interval

Can be selected from the below three modes.

$\log(t) = 0.1$  or  $\log(t) = 1$  steps

Constant interval

0.1 h steps (0.1 to 9,999 h)

Block interval

3 blocks, 0.1 h steps (Test duration must be set to 3 h or more.)

\* The minimum measurement interval shall vary according to test conditions.

#### (5) Failure evaluation

Absolute value ( $\Omega$ )

This system compares resistance of measured specimens against a failure evaluation condition. Based on this result, the system can automatically failure or continue testing for the specific specimen.

Measured resistance that drops below the setting is taken as the failure evaluation condition.

Amount of change ( $\Omega$ )

The amount of increase/decrease from the first measured resistance is taken as the failure evaluation condition.

Rate of change (%)

The rate of increase/decrease from the first measured resistance is taken as the failure evaluation condition.

Leak mode current ( $\mu A$ )

\* All settings can be set to OFF.

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(6) Test status display	Test status is displayed as follows. • Operating status of linked chambers • Test status of all groups • Measured value and operating status for all channels
(7) Contact check	This feature checks whether specimens are open or not and whether or not they are connected prior to starting the test. The check is performed 1 time for a selected group and the measured value is displayed on the main monitor. However, this data can not be saved in the file. Measurement voltage and charging time are the only conditions that can be set for this feature.
(8) Applied voltage monitor	This feature monitors the applied voltage for specimens. When the applied voltage fluctuates $\pm 10\%$ of a setting value, the test of the applicable channels is terminated.

## 10.2 Data processing features

### (1) Measurement data processing and management

- Primary data display
- Primary data graph projection
- User-selected data record deletion
- Data file conversion to text format (CSV file)
- Record jump
- Primary data file merging
- \* Primary data means measured data.

### (2) Results output

The following items can be displayed. (Printing is possible with the optional printer.)

- Measured data and edited data

#### Test conditions

- Graph plots     Plots the change in insulation resistance against time.
  - Change-over-time graph (X-axis: Time)  
(Temperature and humidity data can be displayed at the same time.)
- Graph projections have the following features.
  - User-selected channel display  
Plots maximum-average-minimum and average  $\pm n$  on graph.
  - Resistance can be displayed as absolute value or rate of change.
  - Time and resistance axes can be selected between linear and logarithmic scales.
  - Can paste graph window to clipboard.
  - Can display data for a specific point by clicking on graph.
  - Can project multiple data on same graph.

### 10.3 Linked operation specification for environmental test chamber

A system of a maximum three environmental test chambers can be built using a network (RS-485).

Link environmental test chamber operation as explained in the User's Manual. The chamber may not operate correctly under other settings.

#### (1) Operation linkable environmental test chambers

\* Chambers must be equipped with the RS-485 communication function to link with this system. For linked operation with environmental test chamber other than the types indicated below, contact ESPEC CORP.

Temperature & Humidity Chamber Platinous K Series

Highly Accelerated Stress Test System (HAST Chamber) EHS Series

\* Chambers of the EHS Series cannot be controlled (starting, pausing, stopping and ending) from this system.

Bench-Top Type Temperature & Humidity Chamber SH/SU Series

#### (2) Temperature and humidity monitor

The temperature and humidity of the environmental test chamber are monitored in sync with resistance measurements, and saved in the same file as resistance measurement results.

#### (3) Alarm management

The system controller shuts OFF stress voltage and interrupts testing if an alarm is detected by the environmental test chamber.

## 11. Power outage support

### 11.1 Uninterrupted power supply unit

The uninterrupted power supply unit prevents sampled data from being lost in the event of a power outage by supplying backup power to the PC.

However, this uninterrupted power supply unit does not back up the entire system. Also, the system controller does not shut the system down automatically if a power outage occurs.

### 11.2 Power restoration

This system does not restore operations automatically after recovery from a power outage.

## 12. Accessories

### 12.1 User's Manuals

- Ion migration evaluation system (Basic operation) 1
- Data processing software (Reference) 1

### 12.2 System controller accessories

1 set

### 12.3 Monitor accessories

1 set

### 12.4 Uninterrupted power supply unit accessories

1 set

### 12.5 Measurement unit (6514) accessories

1 set

### 12.6 AMI setup CD

1

### 12.7 GPIB board accessories

1 set

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12.8 PPI board accessories	1 set
12.9 RS-485 cable (10 m)	1
12.10 Heat resistant measuring cable	1 set
12.11 Service manual (only for shipping specification)	1

### 13. Precautions in system use

Observe the following precautions to ensure safe stable system use.

#### 13.1 Precautions in installation and connections

- Install the connection unit in a location where it is not directly exposed to hot vapor exiting from cable ports. Direct contact with hot vapor may damage the connection unit.
- Do not touch the internal pins of the negative (black) connector of the connection unit with bare hands. Foreign matter that adheres to the connector insulation can degrade system performance.
- Disconnect the positive side (red banana plug) of unused channels in test groups from the connection unit. If left connected, voltage is applied to unused channels in the test group, which can lead to damage and electric shock.
- Prevent sample pins and measurement (coaxial) cable wires from contacting the chamber or other enclosures. Contact can result in incorrect data and equipment malfunction.
- Prevent the measuring cable wire and shielding from contacting metal parts inside the chamber. Contact can destabilize measurements and throw off results. It can also divert voltage application away from specimens and prevent migration testing.
- If the white insulation at the end of the measurement (coaxial) cable becomes dirty, clean with highly pure isopropyl alcohol and dry adequately before use again.

#### 13.2 Precautions for PCs

- Do not install other applications than those used by this system. Other applications may adversely affect ESPEC's applications.
- Do not change the default settings of the PC, including the screen saver and energy saving mode. The PC is configured so that the applications operate stably before shipping. Changes may affect the stable operation of ESPEC's applications.
- Before using virus check software for connection to an intranet, make the necessary settings so that virus check software cannot access the AMI folder in the C Drive. Do not connect the PC to the internet. Internet connections may affect the stable operation of ESPEC applications.
- After long continuous tests, restart the computer and then start the next tests. Continuing to run the PC after long continuous tests may affect the stable operation of ESPEC's applications.
- Back up test data periodically as a defense against unexpected PC trouble.

#### 13.3 Measurement interval setting

- Setting a short measurement interval for a system with many cables may interfere with normal measurements. For the recommended measurement interval, see Chapter 5 Run and Operation Procedures in the Basic Operation User's Manual.

#### 13.4 Settings for linked chambers

- Running chambers outside of the guaranteed operating range can cause dewing and other adverse conditions that may prevent accurate measurements from being obtained. Run the chambers within their guaranteed operating range.

